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(54) **Mobile radiotelephone system having service request retry controlled by signal strength**

(57) A base station BS11, upon receiving a service request from a mobile station MS_{N+1}, ascertains whether the service request can be accepted according to the availability of voice channels in the base station, and, if the service request cannot be accepted, compares a measured signal strength of the service request with at least one threshold value. If the signal strength exceeds the threshold, the mobile station is directed to retry the service request on one or more of a first set of channels assigned to neighboring base stations. Otherwise, the mobile station is directed to retry the service request on one or more of at least a second set of channels assigned to neighboring base stations. Accordingly, directed retries nearer the interior of a cell may be restricted or eliminated, whereas directed retries toward the periphery of the cell may be freely allowed or less severely restricted. Since interference is greater from mobile stations transmitting nearer the interior of a cell on the frequency of an adjacent cell than from such mobile stations transmitting from the periphery of the cell, interference is therefore reduced.

FIG. 2a

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

GB 2 260 242 A

Fig.1

26 10 92

Fig. 2a

26 10 92

Fig.3

D.R.

Fig.2b
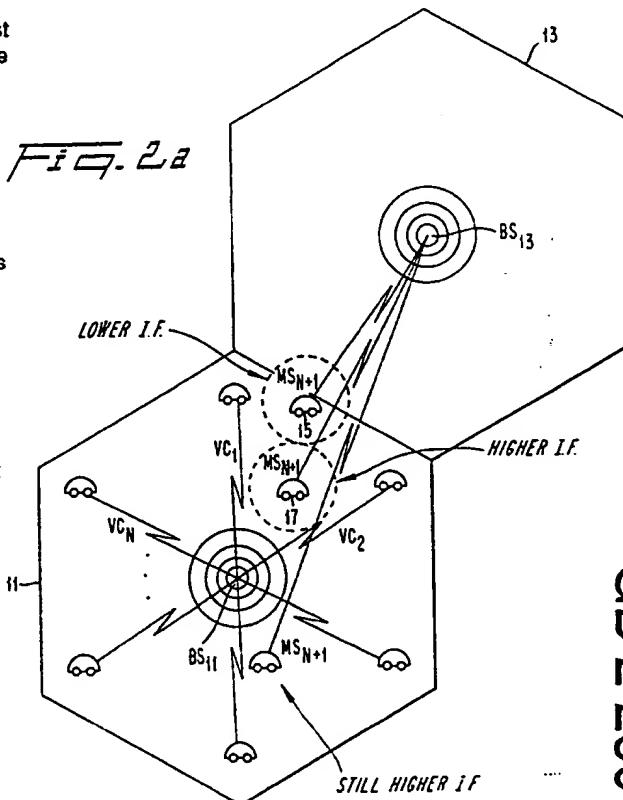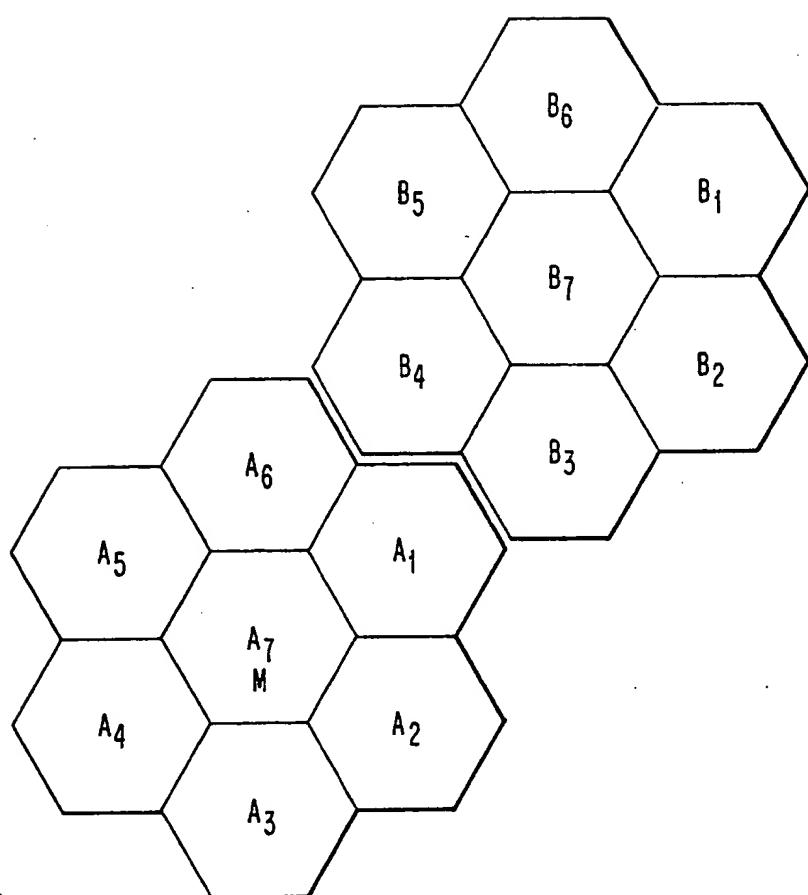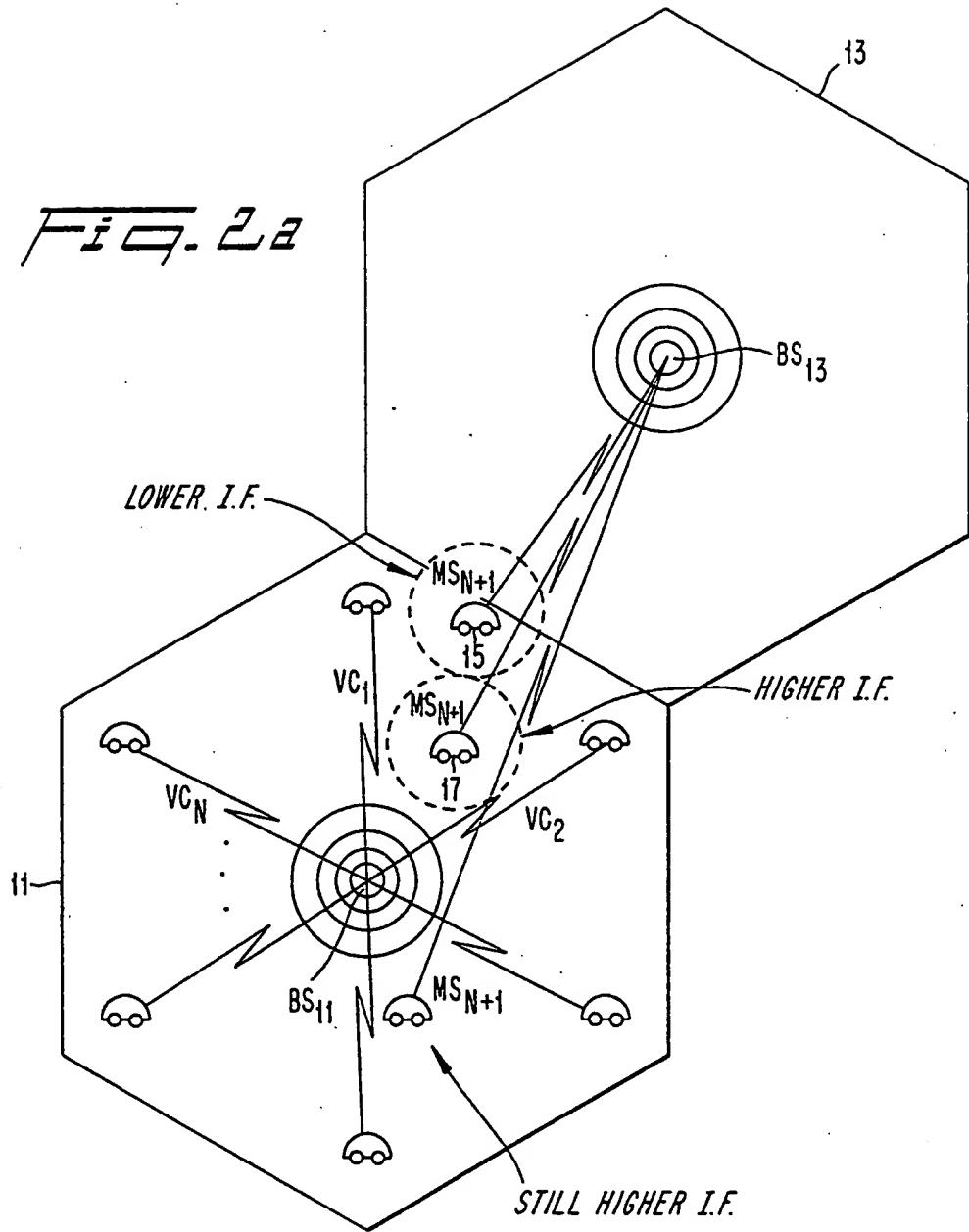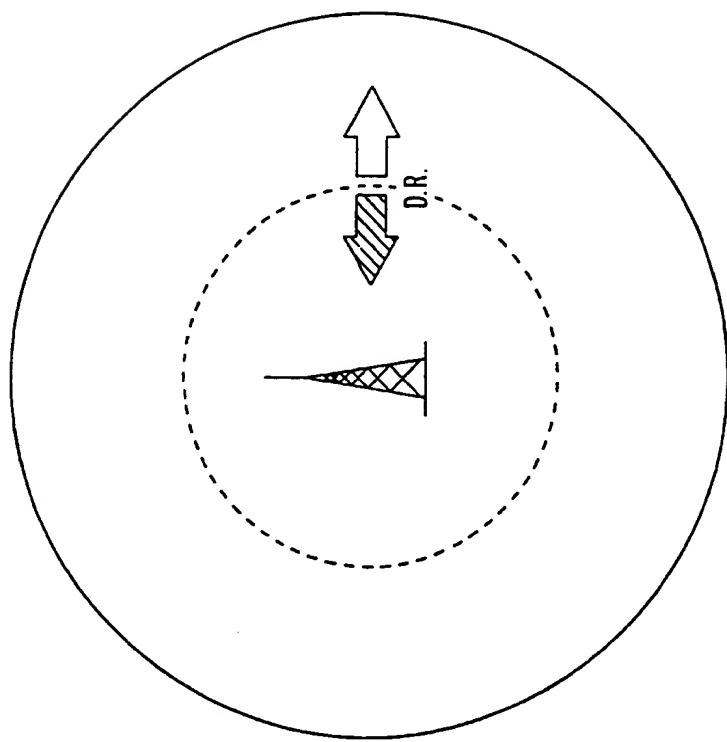
T_1T_2	SCC	CHPOS	CHPOS	CHPOS	RSVD	P
2	2	7	7	7	3	12

26 10 92

Fig. 4

CONGESTION IN CELL

S1 — COMPENSATE SS FROM ACCESS — N

Y

ADD SS_{ADJ}
$SS = SS + SS_{ADJ}$ — S3

S5 — $SS > SS_0$ — N

Y

S7 — USE LIST 2   USE LIST 1 — S9

S11 — IS LIST EMPTY — Y

N

S15 — ACCESS = ORIGINATING — N — (TERMINATING)

Y

S17 — SEND REORDER   SEND RELEASE

S13 — SEND DIRECTED RETRY
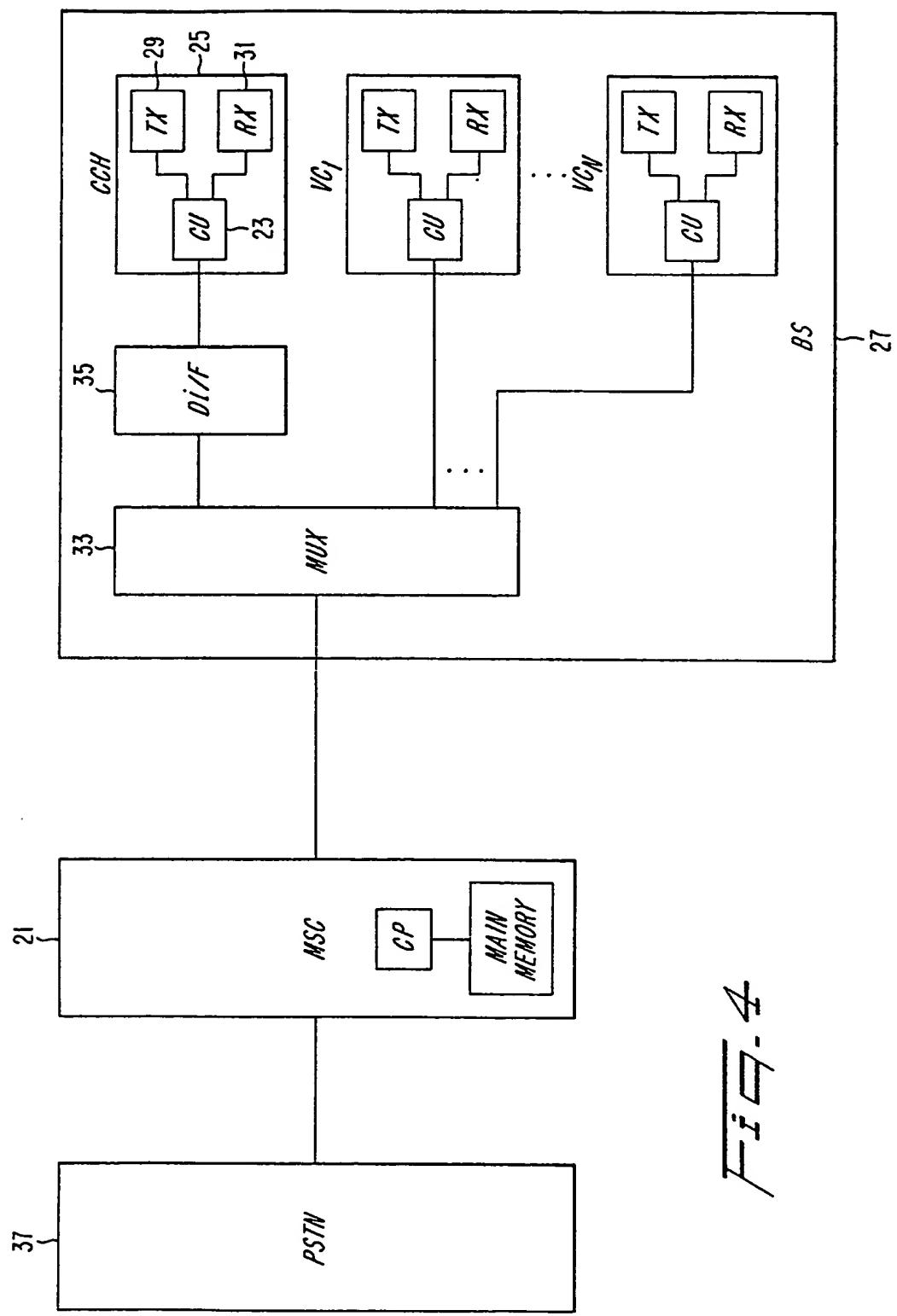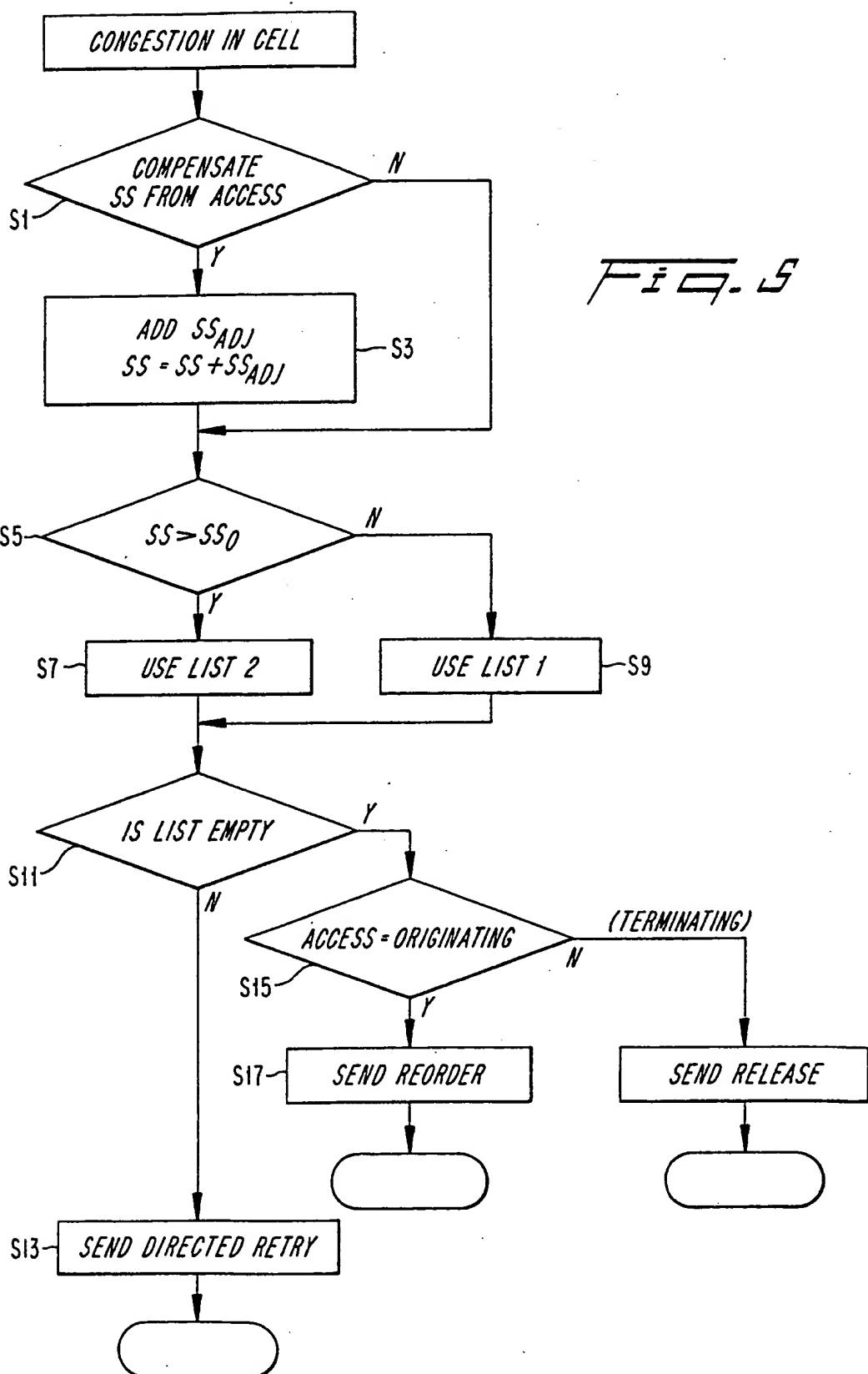
FIG. 5

SIGNAL STRENGTH CONTROLLED DIRECTED RETRY
IN A MOBILE RADIOTELEPHONE SYSTEM

BACKGROUND OF THE INVENTION

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The present invention relates to interference reduction in a cellular mobile radiotelephone system and more particularly to reduction of interference in such a system resulting from a conventional, unrestricted directed retry function.

In mobile radiotelephone systems, one of the main technological challenges is to provide a sufficiently large number of radio channels to meet system demand while at the same time minimizing interference of those channels with one another. In cellular mobile radiotelephone systems, this problem has been addressed by allocating frequencies to cells according to a frequency reuse pattern such that a specified distance, known as the frequency reuse distance, separates geographical areas using a common frequency. Referring to Fig. 1, for example, cells A_1 through A_7 in the lower left-hand cluster of cells each use different sets of frequencies. The same frequencies can be repeated some distance away as in the cluster to the upper right having cells B_1 through B_7. Cell B_4 could use one or more of the same frequencies as cell A_4, and so forth. Mobile stations normally served in cell A_4 cause some interference at the base station and mobile stations in cell B_4, and vice versa. Such interference is usually minimal and is measured by comparing the level of interference to the effective signal level at the base station or mobile station being interfered with to yield a C/I (carrier-to-interference) ratio. The technique of frequency reuse has proven effective in preventing undue interference of same-frequency channels.

A problem arises, however, when a call access is attempted at a time when all of a cell's voice channels available for the call are occupied (cell congestion). The typical response to such a situation is for the mobile

switching center MSC to send a directed retry instruction
to the mobile station attempting access together with a
list of the frequencies of the control channels of all of
the congested cell's neighboring cells. A directed retry
5   instruction essentially informs the mobile station
attempting to access the mobile radiotelephone system that
access is not available through a cell just tried, but
instructs the mobile stations to attempt access again
through one of a number of different neighboring cells.

10   Since no connection of the mobile station to the
radiotelephone system across a traffic channel has yet been
established, there has been no substantial opportunity for
the location of the mobile station relative to cell
boundaries to be determined within the radiotelephone
15   system. Such location may be determined, for example, by
monitoring the strength of transmissions by the mobile
station at several different cell sites. When the location
of the mobile station is known, the MSC may direct the
mobile station to reattempt access through a particular
20   designated cell. Instead, the mobile station monitors
reception on each of the neighboring cell's frequencies and
chooses a strongest received frequency across which to
reattempt access.

Given a flat topography, the frequency chosen will
25   usually be that of the neighboring cell closest to the
mobile station. Because of varying topography, however,
the propagation paths and resulting signals strengths may
be varied such that the strongest received channel may not
always be that of the closest neighboring cell but rather
30   may be that of a more distant neighboring cell. In this
latter situation, the potential for interference increases.

A mobile station M in Fig. 1, for example, would
normally access and be served by cell A_7 but might be
directed to cell A_4 if cell A_7 is congested. If the mobile
35   station M sets up the call in cell A_4, the mobile station is

farther away from cell A_4 than most mobile stations served
by cell A_4. The distance to the closest interferer, cell
B_4, is shorter than normal. The result is a reduced C/I
ratio for the mobile station M and possibly also for a call
handled in cell B_4.

A further source of interference is adjacent channel
disturbance which may occur when adjacent cells use two
frequencies that, although different, are close to one
another. Because filtering techniques do not provide
perfect attenuation of adjacent frequencies, some energy at
an adjacent frequency will pass through the channel filters
and cause interference characterized by a C/A (carrier-to-
adjacent) ratio. In Fig. 1, if the mobile station M
received service from cell A_4 on a frequency f as a result
of directed retry, and if cell A_7 used frequency f+1 or f-1
at the same time, then the mobile station would both
experience and cause interference. Such interference
becomes more widespread the farther toward the interior of
the cell the mobile station is because the mobile station's
signal is stronger over a greater portion of the cell. If
the mobile is at the cell border, interference is less.

To overcome the foregoing problems it would be
desirable to have the capability of treating overflow new
call access requests according to the potential of the
mobile station for causing disruptive interference. In
particular, it would be desirable to restrict the directed
retry function with respect to mobile stations near the
interior of a congested cell.

SUMMARY OF THE INVENTION

According to the present invention, a base station,
upon receiving a service request (in particular a new call
access request) from a mobile station, ascertains whether
the service request can be accepted, and, if the service

request cannot be accepted, compares a measured signal
strength of the service request with at least one threshold
value. If the signal strength exceeds the threshold, the
mobile station is directed to retry the service request on

5   one or more of a first set of channels. Otherwise, the
mobile station is directed to retry the service request on
one or more of at least a second set of channels.
Accordingly, directed retries near the interior of a cell
may be restricted or eliminated, whereas directed retries

10   toward the periphery of the cell may be freely allowed or
less severely restricted. Since interference is greater
from mobile stations transmitting near the interior of a
cell on the frequency of an adjacent cell than from such
mobile stations transmitting from the periphery of the

15   cell, interference is therefore reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features and advantages of the
invention will be readily apparent to one of ordinary skill
in the art from the following written description read in

20   conjunction with the drawings, in which:

Fig. 1 is a cell plan illustrating frequency reuse;

Fig. 2(a) is a representation of interference in a
cell caused by unrestricted directed retries;

Fig. 2(b) is a representation of a directed retry

25   message sent from a radio base station to a mobile station
at the request of the switching center;

Fig. 3 is a representation of how a cell may be
partitioned for purposes of directed retry so as to reduce
interference;

30   Fig. 4 is a block diagram of part of a cellular mobile
radiotelephone system that may be used to implement the
present invention; and

Fig. 5 is a flowchart of a routine executed by the
switching center (MSC) of Fig. 3 in the case of cell

congestion which may be used to implement the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Fig. 2(a), a cell such as cell 11 of a cellular mobile radiotelephone system experiences congestion when it receives a service request from a mobile station at a time when all of the voice channels of the cell are occupied. Assuming all of the available voice channels 1-N of the cell 11 are occupied by mobile stations MS_{1-N}, N representing a maximum number of channels of the cell 11, congestion is experienced when the cell 11 receives a new call access or service request from a mobile station MS_{N+1}. The mobile station may be located near the periphery of the cell as in the case of mobile station 15 or the mobile station may be located near the interior of the cell 11 as in the case of mobile station 17. In either case, the mobile switching center (not shown) in a conventional cellular mobile radiotelephone system will send to the mobile station 15 or 17 a directed retry message as illustrated in Fig. 2(b) instructing that mobile station to try access at a different cell.

Referring to that figure, the directed retry portion of a mobile station control message may consist, for example, of two identical 40-bit words divided into segments as illustrated in the figure. The message preamble consists of four bits, two bits T_1T_2 identifying the word as either a single-word message, the first word in a multi-word message or a second or higher word in a multi-word message. The following two bits SCC may be used elsewhere in the message to designate a SAT (supervisory audio tone) color code as is well-known in the art, but in the illustrated directed retry portion of the message, these bits are ignored. The message postamble contains three reserved bits RSVD and a 12-bit parity field P. The

main portion of the message, consisting of three 7-bit
segments, identifies three channels of three different
neighboring cells in terms of a channel position offset
CHPOS relative to a first access channel. Although not

5   illustrated, a second word of the directed retry portion of
the message assumes the same form as the first word, but
identifies three additional potentially available channels
for a total of six. In response to the directed retry
message, the mobile station monitors received signal

10   strengths on each of the identified channels and selects
the strongest received channel to reattempt its previous
service access request.

In an ideal radio environment, the channel selected in
response to the directed retry message would always be that

15   of the neighboring cell nearest the mobile station, i.e.,
cell 13 in the example of Fig. 2(a). If located near the
periphery, the mobile station will usually not cause major
local interference. If located near the interior, however,
the probability is much greater that the mobile station

20   will create significant local interference. As a result
other ongoing calls in the cell may be audibly disturbed.

Because of numerous obstacles to radio transmission,
the channel selected will not always be that of the
neighboring cell closest to the mobile station.

25   Accordingly, it sometimes occurs that the mobile station
will retry cross-cell with the result that a new call is
established with a mobile station located far from the
assigned area of the cell handling the call. In such an
instance, the possibility for disruptive interference is at

30   its greatest.

Referring to Fig. 3, this type of interference in
congested cells may be reduced by partitioning the cell
into two or more different areas, illustrated as concentric
but not necessarily so, for purposes of directed retry. To

35   reduce potential interference in areas near the interior of

the cell, directed retries are prohibited or tightly restricted. In the areas near the periphery of the cell, directed retries are freely allowed or less tightly restricted. The actual location in the cell of the requesting mobile station is determined by measuring the mobile's signal strength during its service access request.

Referring to Fig. 4, the determinations of congestion in a cell are made by the mobile switching center MSC 21 serving that cell. The mobile switching center MSC 21 includes a central processor CP and a main memory. Measurements of signal strength during service requests are performed by the control unit CU 23 of the control channel CCH 25 of the cell's base station BS 27. The control unit CU 23 controls a radio transmitter TX 29 and a radio receiver RX 31, the three units together realizing a radio channel. In addition to the control channel CCH 25, a number of voice channels VC_1 to VC_N are also provided. Communications on the voice channels are multiplexed directly to and from the switching center MSC 21 through a multiplexer MUX 33. Communications between the control channel CCH 25 and the switching center MSC 21 are formatted by a digital interface Di/F 35. The switching center MSC 21 is connected to the public telephone switching network PTSN 37.

The system of Fig. 4 has been described generically, inasmuch as the present invention may be applied with equal facility to analog, dual-mode, and digital cellular systems.

Referring to Fig. 5, a routine executed by the mobile switching center MSC according to the present invention when congestion is detected in the cell will now be described. During the first step S1, a determination is made whether or not it is necessary to compensate the signal strength measured during the access attempt. Since the power output of the mobile station depends both on its

power class, determined by the maximum output power of the
mobile station, and the power level allowed in the cell, it
is generally necessary to compensate the signal strength
measured during the service access attempt for different

5   power levels and to arrive at a measure of the signal path
loss. "Path loss" describes the attenuation of the mobile
station's radio signal during propagation from the mobile
station to the base station. An indication of the distance
of the mobile station from the base station is thereby

10   obtained.

     Table 1 below shows the output power of a mobile
station operating at different power levels according to
any of three common mobile radiotelephone specifications,
namely TACS, EIA 553, and EIA IS-54, power output being

15   measured in dBW ERP (effective radiated power). As seen in
the table, the identified specifications encompass five
different power classes, a highest power class I occurring
in the TACS specification and a lowest power class IV
occurring in the EIA IS-54 specification. The intermediate

20   three power classes (2, 3 and 4 in the TACS specification
and I, II and III in the EIA specifications) are identical.
A mobile station identifies itself by power class to the
base station during a service request. The specification
used in a particular system is known in advance by both the

25   mobile stations and the land stations. The allowed power
level in a cell is transmitted during filler messages on
the control channel of each base station, and a mobile
station sets its transmission power to the allowed level at
the beginning of an access request.

	POWER CLASS -- PC				
TACS	1	2	3	4	
EIA 553		I	II	III	
EIA IS-54		I	II	III	IV
POWER LEVEL -- PL 0	10	6	2	-2	-2
1	2	2	2	-2	-2
2	-2	-2	-2	-2	-2
3	-6	-6	-6	-6	-6
4	-10	-10	-10	-10	-10
5	-14	-14	-14	-14	-14
6	-18	-18	-18	-18	-18
7	-22	-22	-22	-22	-22
8					-26
9					-30
10					-34

Table 1: Mobile output power (in dBW ERP) as a function of system specification, PC and PL.

Power measurement during access requests may be normalized by adding to the measured signal strengths a constant determined according to specification, power class and power level as set forth in Table 2 below. The signal strength compensation values listed in the table may be changed by adding to or subtracting from each of the values an arbitrary number without affecting the normalization operation. In other words, no special significance should be attached to the particular numbers in Table 1 themselves; what is important is the relative difference between the various values. Although only three mobile radiotelephone specifications are listed, other specifications may of course be treated in a similar fashion. It will be observed that when the corresponding values in Tables 1 and 2 are added, a constant number (10) is obtained in each instance. By normalizing the measured signal strengths it is therefore as if each mobile were to transmit always at the same power regardless of power class and power level.

	POWER CLASS -- PC				
TACS	1	2	3	4	
EIA 553		I	II	III	
EIA IS-54		I	II	III	IV
POWER LEVEL -- PL 0	0	4	8	12	12
1	8	8	8	12	12
2	12	12	12	12	12
3	16	16	16	16	16
4	20	20	20	20	20
5	24	24	24	24	24
6	28	28	28	28	28
7	32	32	32	32	32
8					36
9					40
10					44

Table 2: Compensation values as a function of system specification, PC and PL.

Referring again to Fig. 5, the signal strength measured during the mobile stations service access request is compensated if necessary (step S3) by an amount SS_{adj} as determined from a table like that of Table 2. Thereafter, the adjusted signal strength is compared with a signal strength threshold SS_0 (step S5). If the adjusted signal strength is greater than SS_0, then the mobile station may be adjudged to be in the interior of the cell (indicating the need for care to be taken to avoid undue interference); else, if the adjusted signal strength is less than SS_0, then the mobile station may be adjudged to be near the periphery of the cell. Different channel lists are maintained for each of the two areas, and depending on the result of the comparison step S5, a first list LIST1 is used (step S9) if the threshold SS_0 is exceeded, else a second list LIST2 is used if the threshold SS_0 is not exceeded. In order to prohibit directed retries near the interior of the cell but freely allow directed retries near the periphery of the cell, for example, LIST 1 used in the event that the threshold SS_0 is not exceeded would contain the channels of all of the congested cells neighboring cells and LIST2 used

in the event that the threshold SS_0 is exceeded would be empty.

Rather than inflexibly fixing the contents of the lists, however, the lists may instead be adjusted according to prevailing cell conditions. For example, if cell-wide interference levels are generally greater than would normally be permitted, directed retries may be disallowed altogether such that both of the lists would be empty. If a directional indication of the mobile station's location is available, then although the mobile station may not be at the periphery of the cell, retries may nevertheless be allowed except for cross-cell retries.

The contents of the lists may also be adjusted so as to control traffic in adjacent cells. A particular one of the cells adjacent to a cell in which access is being attempted may have very good coverage over that cell. As a result, most of the mobile stations given directed retry commands will lock onto this particularly strong adjacent cell. Such an occurrence will not just increase interference but will cause congestion in the strong adjacent cell. Referring again to Fig. 1, for example, cell A_1 may often be congested so that directed retry is used, cells A_2, A_6, A_7, B_3, and B_4 normally being designated in a directed retry message. All of the latter cells have some coverage in the area of cell A_1. Cell B_4, however, may have the strongest coverage of the adjacent cells over most of the area of cell A_1. The majority of the overflow traffic from cell A_1 will therefore tend to end up in cell B_4, causing it to become unnecessarily congested. By withdrawing cell B_4 from one or more lists, the overflow traffic of cell A_1 may be spread to other adjacent cells besides cell B_4. Such withdrawal may be done automatically, based for example on congestion in the cells, or manually by an operator or radio network engineer.

Depending on available network resources, composition of the lists may be determined using advanced analytical techniques. In the Ericsson CMS 88 cellular mobile telephone system, a cell traffic recording function records

5   most events occurring in the course of a call including call set-up, directed retry, handoff and disconnection. By comparing events in co-channel cells (non-adjacent cells using the same transmission frequency), for example, trends may be detected and causative links may be established

10   between call set-up after directed retry in one cell and bad quality or dropped calls in co-channel cells. Referring to Fig. 1, experience may have shown that cell A_4 is a bad choice for directed retry in the case of a mobile station as far away from the normal service area of cell A_4

15   as mobile station M. Cell A_4 should therefore be excluded from the list of possible directed retry candidates for mobile station M. Although cells A_2 and A_3 may be as far away as cell A_4, the interference resulting from a connection with these cells may have been demonstrated to

20   be lower.

Although only two lists are illustrated, the present invention may be adapted to include three or more lists in a manner that will be evident to those of ordinary skill in the art. In other words, the cell may be partitioned into

25   three or more areas, with separate directed retry candidate cell lists being maintained for mobile stations in each of the three or more areas.

So long as the selected list is not empty as determined in step S11, a directed retry message is then

30   sent to the mobile station in step S13, including in the message the channels found in the selected list. If the selected list is empty, a determination is made in step 15 whether the access request is an originating call request (a call from a mobile in the cell) or a termination call

35   request (a call to a mobile in the cell). In other words,

an access request may be independently initiated by a
mobile station or may be made by a mobile station in
response to a page by a base station. If an access is a
terminating call request and the selected list is empty,
the mobile station is simply instructed in step S19 to
release the call. In this instance, since no actual call
has been established, the owner of the terminating mobile
station remains unaware that any call to him has been
attempted, and no further action is necessary. If the
request is an origination request and the list is empty, a
reorder message is sent to the mobile station in step S17
whereby the mobile subscriber is informed that service is
temporarily unavailable. The reorder message may cause a
"fast busy" tone to be produced by the mobile station,
encouraging the subscriber to try again.

An alternative to not sending any directed retry
message in the case of a null set is to send a directed
retry message identifying only the cell sending the message
as a candidate for directed retry. The mobile station will
then make another access attempt to the same cell without
requiring any action on the part of the subscriber.
Measurements have shown that approximately two seconds
usually elapses between the time a directed retry message
is sent in response to a first access attempt and the time
of a second access attempt in response to the directed
retry message. More often than not, the cell will still be
congested, but in the intervening two seconds, a channel
will have become available in a sufficient number of
instances to make such a technique worthwhile. This
technique could be further enhanced by deliberately
delaying the transmission of the directed retry order from
the base station for a few seconds in order to increase the
probability that a voice channel will have become available
by the time a retry is made. Since the mobile station

expects a response within five seconds, the delay must be
shorter than that.

By selectively controlling the permissible channels
for directed retry sent in a directed retry message based
on the position of the mobile station, fewer call
connections are established by mobile stations located in
one cell but associated with distant neighboring cells. As
a result, interference levels may be improved.

It will be appreciated by those of ordinary skill in
the art that the present invention can be embodied in other
specific forms without departing from spirit or essential
character thereof. The presently disclosed embodiments are
therefore considered in all respects to be illustrative and
not restrictive. The scope of the invention is indicated
by the appended claims, rather than the foregoing
description, and all changes which come within the meaning
and range of equivalents thereof are intended to be
embraced therein.

WHAT IS CLAIMED IS:

1.   A method of control communications with a mobile station in a radiotelephone network, comprising the steps of:

5   receiving a service request from said mobile station at a base station;

measuring at said base station the signal strength of a signal from said mobile station during said service request;

10   ascertaining whether said service request can be accepted based on the availability of voice channels assigned to said base station and, if said service request cannot be accepted;

comparing said signal strength with at least one
15   threshold value; and

directing said mobile station to retry said service request on one or more of a first set of channels if said signal strength exceeds said threshold; and otherwise directing said mobile station to retry said
20   service request on one or more of at least a second set of channels.

2.   The method of claim 1 wherein the channels in said first and seconds sets are variable.

3.   The method of claim 1 wherein said threshold is
25   variable.

4.   The method of claim 1 wherein said signal strength is compared with a plurality of thresholds and said mobile station is directed to retry said service request on one or more channels of one of a number of sets
30   of channels, said number of sets being one more than said plurality of thresholds.

5. The method of claim 1 wherein one or both of said first and second sets is the null set, in which case said mobile station is directed, before more than several seconds have elapsed, to retry said service request to said base station.

6. The method of claim 1, further comprising the step of: normalizing said measured signal strength to account for actual transmission power of said mobile station, said normalized measured signal strength being indicative of a distance of said mobile station from said base station.

7. The method of claim 1 wherein said signal strength is normalized after said measuring and before said comparing.

8. An apparatus for control communications with a mobile station in a radiotelephone network, comprising the steps of:

means for receiving a service request from said mobile station at a base station;

means for measuring at said base station the signal strength of a signal from said mobile station during said service request;

means for ascertaining whether said service request can be accepted based on the availability of voice channels assigned to said base station;

means, responsive to a determination by said means for ascertaining that said service request cannot be accepted, for comparing said signal strength with at least one threshold value; and

means responsive to said comparing means for directing said mobile station to retry said service request on one or more of a first set of channels if said signal strength

exceeds said threshold, and otherwise, for directing said
mobile station to retry said service request on one more of
at least a second set of channels.

9.   In a cellular mobile radiotelephone system having
a plurality of cells and a plurality of mobile stations, a
method of reducing interference of a call made by a mobile
station within a congested cell, comprising the steps of:
      obtaining an indication of said mobile station's
location relative to boundaries of said cell;
      freely allowing said mobile station to retry said call
in at least one neighboring cell when said mobile station
is indicated as being located in an area of said congested
cell where interference with established calls by said call
is likely to be small; and
      restricting said mobile station from retrying said
call when said mobile station is indicated as being located
in an area of said congested cell in which interference
with established calls by said call is likely to be
greater.

10. The method of claim 9 wherein said locating step
comprising the steps of:
      measuring at a base station of said congested cell
signal strength of a signal transmitted by said mobile
station on a control channel of said base station; and
      normalizing said measured signal strength to account
for actual transmission power of said mobile station, said
normalized measured signal strength being indicative of a
distance of said mobile station from said base station.

11. The method of claim 10, wherein said locating
step further comprises the step of comparing said
normalized signal strength to a threshold value.

12. The method of claim 9, wherein allowing said mobile station to retry said call comprises the step of sending a directed retry message to said mobile station listing a first set of candidate cells for retry of said call.

13. The method of claim 12, wherein restricting retry by said mobile station of said call comprises the step of sending a directed retry message to said mobile station listing a second set of candidate cells different from said first set for retry of said call.

14. The method of claim 12, wherein said second set is the null set.

15. In a cellular mobile radiotelephone system having a plurality of cells and a plurality of mobile stations, an apparatus for reducing interference of a call made by a mobile station within a congested cell, comprising:
        means for locating said mobile station relative to boundaries of said cell;
        means for allowing said mobile station to retry said call in at least one neighboring cell when said mobile station is located in an area of said congested cell interference with established calls by said call is likely to be small; and
        means for restricting said mobile station from retrying said call when said mobile station is located in an area of said congested cell where interference with established calls by said call is likely to be greater.

16. The apparatus of claim 15, wherein said means for locating comprises:
        means for measuring at a base station of said congested cell signal strength of a signal transmitted by

said mobile station on a control channel of said base station; and

    means for normalizing said measured signal strength to account for actual transmission power of said mobile

5   station, said normalized measured signal strength being indicative of a distance of said mobile station from said base station.

    17.   The apparatus of claim 16, wherein said means for locating further comprises means for comparing said

10   normalized signal strength to a threshold value.

    18.   The apparatus of claim 15, wherein said means for allowing said mobile station to retry said call comprises means for sending a directed retry message to said mobile station listing a first set of candidate cells for retry of

15   said call and means for storing a list of said candidate cells in said first set.

    19.   The apparatus of claim 18, wherein said means for restricting retry by said mobile station of said call comprises means for sending a directed retry message to

20   said mobile station listing a second set of candidate cells for retry of said call and means for storing a list of said candidate cells in said second set.

    20.   A method of control communication with a mobile station in a radiotelephone network substantially as herein described with reference to the accompanying drawings.

    21.   An apparatus for control communication with a mobile station in a radiotelephone network substantially as herein described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) H4K (KYR KYX)
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(ii) Int Cl (Edition 5) H04Q

Search Examiner

MR S J L REES

Databases (see over)
(i) UK Patent Office

(ii)

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Documents considered relevant following a search in respect of claims   ALL CLAIMS

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 1568262 (NIPPON) whole document especially lines 33-55 of page 1	1, 8, 9, 15

Category	Identity of document and relevant passages	Relevant to claim(s.

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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